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A FURTHER EXAMINATION OF THE DETERMINANTS
OF JOB SATISFACTION IN PROGRAMMER/ANALYSTS

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ABSTRACT

In the past, research examining the determinants of job satisfaction in programmer/analysts has focused on the relationship between characteristics of the job itself - such as skill variety, task identity, task significance, autonomy, and feedback from the job - and job satisfaction. This paper extends the previous research by examining the effects on job satisfaction of certain aspects of programmer/analysts' relationships with co-workers, project leaders, and users. Specifically, the paper examines the relationship between job satisfaction and role conflict and role ambiguity, and quality of leadership provided by supervisors and peers. A questionnaire measuring job characteristics, role conflict and ambiguity, leadership characteristics, and job satisfaction was administered to 25 programmer/analysts at an insurance company. The results indicate that both role and leadership variables correlated more highly with job satisfaction than job characteristics. The implications of these results for both information systems managers and researchers are discussed.

The study of job satisfaction and its determinants is a major research area in industrial and organizational psychology. One estimate is that, as of 1976, over 3000 articles have been written examining job satisfaction in general and the satisfaction of specific types of workers (Locke, 1976). With one major exception (Couger and Zawacki, 1980), almost no research has been conducted on the job satisfaction of programmer/analysts.

There are strong reasons for studying job satisfaction and its determinants in programmer/analysts. First, researchers have shown that job satisfaction is negatively correlated with several outcome variables, such as absenteeism and turnover (Locke, 1976). Turnover is of special relevance for MIS managers, due to the shortage of experienced programmer/analysts and the high cost of training new hires.

Second, there is some evidence that there is a relationship between job satisfaction and productivity. In systems development, productivity improvement has been traditionally obtained through the introduction of new productivity aids, such as higher level languages and structured development methods. Improving job satisfaction could also be an important 'tool' for improving productivity. Couger and Zawacki hypothesize that improved motivation among programmer/analysts could lead to a reduction in the large backlog of systems awaiting development. There is, however, much debate about the strength and direction of the link between productivity or performance and job satisfaction (Bagozzi, 1980, Chapter 10; Sheridan and Slocum, 1975; Wanous, 1974).

Third, it is important to study the determinants of job satisfaction in programmer/analysts to gain a better understanding of the effects of the introduction of a new tool or technique. Productivity improvement aids are becoming increasingly popular in data processing organizations. (See Goldstein, 1982a and

Martin, 1982 for an examination of these tools and their impact on system development.) There is, however, a controversy concerning the impact of such aids on the job satisfaction of programmer/analysts. Some researchers have argued that the use of these aids reduces the skill level of programmer/analysts (Kraft, 1977), which could lead to a decrease in job satisfaction. However, we could argue that the use of these aids increases job satisfaction by making the job of programmer/analysts more manageable. If the use of productivity aids decreases job satisfaction, then its personnel costs could outweigh its benefits. Alternatively, if job satisfaction increases with the use of productivity aids, this would provide further evidence for those advocating its use.

This paper describes a study extending Couger and Zawacki's previous research. This study, a survey of job satisfaction in programmer/analysts, examines several variables not considered in the Couger and Zawacki study. In order to place the survey in perspective, the work of these researchers will first be reviewed. Following this, two sets of variables - role variables and leadership variables - hypothesized to be important determinants of job satisfaction, will be introduced. Finally, the results of a survey designed to examine the impact of these variables on job satisfaction, will be presented and analyzed.

OVERVIEW

Hackman and Oldham's (1976, 1980) Job Characteristic Model, the model used by Couger and Zawacki (1980), is the dominant paradigm in the literature on job design (Evans, Kiggundu, and House, 1979). The premise of the model is that personal and work related outcome variables, such as job satisfaction and work effectiveness, are

related to objective characteristics of the job. The model focuses on five core job dimensions - skill variety, task identity, task significance, autonomy, and feedback from the job itself - that are hypothesized to be related to three key psychological states - experienced meaningfulness of the work, experienced responsibility for the work, and knowledge of results. These psychological states are, in turn, related to personal and work related outcomes, including job satisfaction. These relationships are moderated by an individual's knowledge and skill, growth need strength (need for personal accomplishment), and satisfaction with his or her job contexts, such as pay and supervision.

In a survey of over 1000 programmers, analysts, and programmer/analysts, data presented by Couger and Zawacki indicated that d. p. professionals were very similar to other professional and technical employees in their reactions to their job (See Table 1). There was almost no difference between the two groups in the five core job dimensions, or in feedback from agents, growth need strength, or supervisor satisfaction. Programmer/analysts did, however, experience higher general job satisfaction and lower satisfaction with their co-workers than other professionals. One possible explanation for the higher job satisfaction is the newness of the data processing field. Couger and Zawacki found significant positive correlations between ratings on the job dimensions and job satisfaction (between .26 and .40). This is in agreement with the findings of Hackman and Oldham (1975). Improvements in the core dimensions should, therefore, lead to improved job satisfaction.

The Job Characteristic Model, however, assumes that the job itself provides most of the motivation and satisfaction for the worker. Hackman and Oldham state that the model was developed to study "jobs that are done independently by individuals working more or less alone" (Hackman and Oldham, 1980, page 61). This is not necessarily true in systems development jobs, where programmer/analysts

TABLE 1. COMPARISON OF JOB CHARACTERISTIC DATA FOR PROGRAMMER/ANALYSTS
AND OTHER PROFESSIONAL AND TECHNICAL WORKERS

VARIABLE	PROGRAMMER/ANALYSTS		OTHER PROFESSIONAL AND TECHNICAL WORKERS	
	MEAN	STD DEV	MEAN	STD DEV
SKILL VARIETY	5.4	1.1	5.4	1.0
TASK IDENTITY	5.2	1.1	5.1	1.2
TASK SIGNIFICANCE	5.6	1.2	5.6	.95
AUTONOMY	5.3	1.1	5.4	1.0
FEEDBACK FROM JOB	5.1	1.1	5.1	1.1
FEEDBACK AGENTS	4.0	1.6	4.2	1.4
GENERAL SATIS.	5.3	1.2	4.9	.99
CO-WORKER SATIS.	5.1	1.2	5.5	.85
SUPERVISOR SATIS.	4.9	1.5	4.9	1.3
GROWTH NEED STRENGTH (WOULD LIKE FORM)	5.9	.99	6.1	.82

typically work in teams and spend a great deal of time dealing with users, co-workers, and managers.

For example, consider a programmer/analyst who is responsible for the analysis, design, and coding of a large and complex part of a system that is critical to the success of the organization for which he or she works. There are several user groups for the system and each wants it to perform different functions. Even though the programmer/analyst's job might be high on all five job characteristics, his or her job satisfaction might be low because of the problems involved in dealing with conflicting user groups. Extensions to Hackman and Oldham's model, therefore, are needed to study the impact of factors, other than job characteristics, on the job satisfaction of programmer/analysts.

One extension to the Job Characteristic Model is the inclusion of role perceptions (Kahn, Wolfe, Quinn, Stroek, and Rosenthal, 1964). A role is usually defined as the set of expectations about the behavior of a person who is in a particular position within an organization. A role is, therefore, defined more broadly than a job, which is typically defined as the set of tasks performed by an

individual. The study of roles explicitly considers the interactions of a worker with others, whereas the study of jobs concentrates on the relationship between a worker and the tasks he or she performs. Kahn, et al. note that the growth of organizations has led to more complex and specialized jobs, such as systems development, where there is a great deal of interdependency among people. The conflict and ambiguity found in these jobs can be a major source of personal stress and a important determinant of job satisfaction.

In their research, Kahn, et al. identify two variables - role conflict and role ambiguity - as potential sources of stress. Role conflict is "the degree of incongruity or incompatibility in the expectations or requirements communicated to a focal person" (Bostrom, 1980, page 92). These researchers have identified several components of role conflict. They are:

person-role conflict - the extent to which role expectations are incongruent with the orientations, standards, or values of the focal person.

intrasender conflict - the extent to which role requirements are incompatible with the resources or capabilities of the focal person.

intersender conflict - the extent to which role requirements or expectations from one party oppose those from one or more other parties.

role overload - the extent to which the various role expectations communicated to the focal person exceed the amount of time available for their accomplishment (Bostrom, 1980, page 93).

Role ambiguity is "the degree to which desired expectations are vague, ambiguous, or unclear, thereby making it difficult for the person to fulfill the requirements [of his role]" (Bostrom, 1980, page 93).

In their study of various jobs, Kahn, et al. found role conflict and role ambiguity to be high among people whose job required being innovative or involved boundary spanning, dealing with people outside of the person's work group. Specifically, they found high role conflict and ambiguity in a job called "IBM Converter," which involved "developing computer programs that will make some of the

work of other departments [within an organization] amenable to processing by electronic equipment" (Kahn, et al., 1964, page 116). This type of job is very similar to the work that is currently performed by programmer/analysts.

In some more recent research, Bostrom (1980) examined role conflict and role ambiguity in 75 user-designer dyads involved in systems maintenance. He found significant negative correlations between the role conflict and ambiguity felt by the designer and his or her job satisfaction. He also found significant negative correlations between these variables and the user's information satisfaction. Bostrom's results are consistent with the findings of other researchers who have examined the relationship between role variables and job satisfaction in many different types of jobs and organizations (e.g. Rizzo, House, and Lirtzman, 1970; House and Rizzo, 1972; Miles, 1976; Schuler, Aldag, and Brief, 1977).

A second extension to the Job Characteristic Model is the inclusion of leadership characteristics. The quality of leadership provided by a programmer/analyst's supervisor and peers is another potentially significant determinant of job satisfaction. Since systems development is usually a team effort, involving much interaction among team members, the quality of the interactions and of the leadership and guidance provided by a programmer/analyst's supervisor and peers could be important determinants of the programmer/analyst's job satisfaction.

The relationship between leadership and organizational and personal outcomes has been well documented. In reviewing the leadership research, Bowers and Seashore (1966) found that four characteristics of leadership behavior were common to many studies. They are:

support - behavior that enhances someone else's feeling of personal worth and importance.

interaction facilitation - behavior that encourages members of the [work] group to develop close, mutually satisfying relationships.

goal emphasis - behavior that stimulates an enthusiasm for meeting the group's goal or achieving excellent performance.

work facilitation - behavior that helps achieve goal attainment by such activities as scheduling, coordinating, planning, and by providing resources such as tools, materials, and technical knowledge (Bowers and Seashore, page 247).

These four characteristics can be used to examine the quality of leadership provided by both the supervisor and the peers of a programmer/analyst. Bowers and Seashore (1966) found significant positive correlations between measures of these characteristics and job satisfaction and performance.

The survey described below examines the relative importance of job characteristics, role perceptions, and leadership characteristics as determinants of job satisfaction in programmer/analysts. Based on the boundary spanning nature of programmer/analysts' jobs, and the high level of team interaction needed in systems development, it is hypothesized that role conflict, role ambiguity, and the characteristics of supervisor and peer leadership discussed above will be significant determinants of job satisfaction in programmer/analysts.

RESEARCH METHOD

Subjects and Procedure

Data were collected from 25 programmer/analysts at a large Northeast insurance company. The programmer/analysts were involved in new systems development, mostly of large transaction processing systems.

The questionnaire used to collect the data was administered in a classroom setting to three groups of between seven and ten subjects at a time. The procedures

recommended by Hackman and Oldham (1980, Appendix D) were followed in administering the questionnaire.

Measures

Role Conflict and Role Ambiguity - The role conflict measure is based on an eight item scale developed by Rizzo et al. (1970). Miles and Perrault (1976) found that the scale could be separated into subscales that measures each of the components of role conflict identified by Kahn, et al. (1964). The fourth subscale, used to measure role overload, was not significantly correlated with job satisfaction in a study of programmer/analysts (Bostrom, 1980) and is not included in this study. A sample item for each subscale, with the number of items in the subscale in parentheses, follows:

person-role conflict (2) - "I have to do things that should be done differently."

intrasender conflict (2) - "I receive an assignment without adequate resources and materials to execute it."

intersender conflict (4) - "I do things that are apt to be accepted by one person and not by others."

The six item role ambiguity measure developed by Rizzo, et al. (1970) is used. A sample item follows: "There are clear planned goals and objectives for my job." Schuler, Brief and Aldag (1977) conducted a scale analysis of both the role conflict and role ambiguity measures and recommended their continued use.

Supervisor and Peer Leadership Measures - The scales developed by Bowers and Seashore (1966) are used to measure the supervisor and peer leadership characteristics. The first set of scales consists of thirteen items that measure the four supervisor leadership characteristics. The second set consists of eleven items that measure the four characteristics of peer leadership. Sample supervisor leadership items follow:

support - "To what extent is your supervisor friendly and easy to approach?"

goal emphasis - "To what extent does your supervisor encourage people to give their best effort?"

work facilitation - "To what extent does your supervisor show you how to improve your performance?"

interaction facilitation - "To what extent does your supervisor encourage the people who work for him to work as a team?"

Yunger and Hunt (1976) found these characteristics similar to the characteristics identified in the Ohio State leadership behavior description (LBDQ) scales.

Job Characteristics - Hackman and Oldham's Job Diagnostic Survey (JDS) provides measures of the five job characteristics. Each characteristic is measured with three questions from two different sections of the survey. Sample items follow:

skill variety - "The job requires me to use a number of complex or high-level skills."

task identity - "The job is arranged so that I do not have the chance to do an entire piece of work from beginning to end."

task significance - "This job is one where a lot of other people can be affected by how well the work gets done."

autonomy - "The job requires a lot of cooperative work with other people."

feedback from the job itself - "Just doing the work required by the job provides many chances for me to figure out how well I am doing."

Job Satisfaction - Four scales from the JDS are used to measure job satisfaction. The principle measure is Hackman and Oldham's general satisfaction scale. The other scales measure satisfaction with the opportunity of growth in the job, with co-workers, and with supervision. A sample item for each scale, with the number of items in the scale in parentheses, follows:

general satisfaction (5) - "Generally speaking, I am very satisfied with my job."

growth satisfaction (4) - "How satisfied are you with the amount of personal growth and development you get in doing your job?"

co-worker satisfaction (3) - "How satisfied are you with the people you talk to and work with on your job?"

supervisor satisfaction (3) - "How satisfied are you with the amount of support and guidance you receive from your supervisor?"

Other Measures - The other scales found in the long form of the JDS are also included in the questionnaire. They measure growth need strength, pay and job security satisfaction, internal work motivation, and the three psychological states identified by Hackman and Oldham (1980). These scales permit comparison of the results of this survey to the findings of Couger and Zawacki (1980) and Hackman and Oldham (1980).

RESULTS

Means, standard deviations, and internal consistent reliabilities for the scales and subscales used in the study are presented in Table 2. Most reliabilities are within the satisfactory range specified by Nunnally (1978) and are consistent with results presented in previous studies (Hackman and Oldham, 1975; Schuler, Aldag, and Brief, 1977; Yunker and Hunt, 1976). Three variables had unacceptable reliabilities - skill variety, person-role conflict, and peer goal emphasis.

Table 3 presents comparisons of this data with the data obtained in studies by Couger and Zawacki (1980) and Hackman and Oldham (1980). In general, this sample scored lower than either of the other samples on measures of job characteristics and outcomes. The sample did, however, score significantly higher on dealing with others than the Hackman and Oldham sample, indicating that systems development jobs involve more interactions with co-workers and other members of the organization than the jobs performed by other technical and professional workers. Even though there

TABLE 2. SUMMARY STATISTICS FOR DEPENDENT AND INDEPENDENT VARIABLES

VARIABLE	MEAN	STD DEV	INTERNAL CONSISTENCY RELIABILITY
SKILL VARIETY	5.44	.768	.27
TASK IDENTITY	4.68	1.33	.73
TASK SIGNIFICANCE	4.84	1.20	.63
AUTONOMY	4.85	1.05	.76
FEEDBACK FROM JOB	4.59	1.18	.84
ROLE AMBIGUITY	3.04	1.13	.87
PERSON-ROLE CONFLICT	4.34	1.12	.30
INTRASENDER CONFLICT	3.90	1.64	.84
INTERSENDER CONFLICT	4.08	1.19	.59
ROLE CONFLICT	4.10	1.05	.77
PEER SUPPORT	4.98	.941	.72
PEER GOAL EMPHASIS	4.63	.638	.39
PEER WORK FACILITATION	4.26	.991	.70
PEER INTERACTION FAC.	4.52	1.12	.80
SUPERVISOR SUPPORT	4.74	1.18	.86
SUP. GOAL EMPHASIS	4.84	1.06	.79
SUP. WORK FACILITATION	3.86	1.00	.72
SUP. INTERACTION FAC.	4.34	1.29	.68
GENERAL SATISFACTION	4.85	1.12	.76
GROWTH SATISFACTION	4.87	1.15	.78
CO-WORKER SATISFACTION	5.20	.877	.67
SUPERVISOR SATISFACTION	4.61	1.25	.79

Note: all variables are seven-point scales.

were differences in magnitude between this sample and the other two samples on the different scales, the pattern of responses was very similar.

Correlations between the independent variables - job characteristics, role perceptions, and leadership characteristics - and the dependent variable - job satisfaction - are found in Table 4. Most of the independent variables are significantly correlated with the satisfaction variables. The range of correlations between the job characteristics and general satisfaction are consistent with the results obtained by Couger and Zawacki (1980). Of the job characteristics, autonomy

TABLE 3. COMPARISON OF THIS JOB CHARACTERISTIC DATA WITH PREVIOUS STUDIES

VARIABLE	CURRENT STUDY		COUGER AND ZAWACKI STUDY		HACKMAN AND OLDHAM STUDY ^a	
	MEAN	STD DEV	MEAN	STD DEV	MEAN	STD DEV
SKILL VARIETY	5.4	.77	5.4	1.1	5.4	1.0
TASK IDENTITY	4.7	1.3	5.2b	1.1	5.1b	1.2
TASK SIGNIFICANCE	4.8	1.2	5.6b	1.2	5.6b	.95
AUTONOMY	4.8	1.0	5.3b	1.1	5.4b	1.0
FEEDBACK FROM JOB	4.6	1.2	5.1b	1.1	5.1b	1.1
FEEDBACK AGENTS	4.7	.99	4.0	1.6	4.2	1.4
DEALING WITH OTHERS	6.3	.70	-	-	5.8b	.96
EXP. MEANINGFULNESS	4.9	.82	-	-	5.4b	.87
EXP. RESPONSIBILITY	5.1	.48	-	-	5.8b	.72
KNOWLEDGE OF RESULTS	4.8	1.0	-	-	5.0	.99
GENERAL SATISFACTION	4.8	1.1	5.3b	1.2	4.9	.99
INTERNAL WORK MOTIV.	5.5	.67	-	-	5.8	.99
GROWTH SATISFACTION	4.9	1.1	-	-	5.1	1.1
JOB SECURITY SATIS.	4.5	1.5	-	-	5.0	1.2
PAY SATISFACTION	4.9	1.6	-	-	4.4	1.5
CO-WORKER SATIS.	5.2	.87	5.1	1.2	5.5	.85
SUPERVISOR SATIS.	4.6	1.2	4.9	1.5	4.9	1.3
GROWTH NEED STRENGTH (WOULD LIKE FORM)	6.1	.71	5.9	.99	6.1	.82
GROWTH NEED STRENGTH (JOB CHOICE)	4.7	.73	-	-	4.8	.64
GROWTH NEED STRENGTH (COMBINED)	5.4	.60	-	-	5.6	.57

a - data for other professional and technical workers (Hackman and Oldham, 1980)

b - significant difference ($p < .05$) with this study's data

correlated most highly with the satisfaction measures. Among the role variables, role ambiguity correlated more highly with satisfaction than role conflict. Of the role conflict subscales, person-role conflict - the perception that your job should be done differently - correlated most highly with the satisfaction measures. This is consistent with Bostrom's (1980) findings. Among the leadership characteristics, the work facilitation measures, for both peers and supervisors, correlated most highly with the satisfaction measures.

TABLE 4. CORRELATION OF DEPENDENT VARIABLES WITH SATISFACTION VARIABLES

	GENERAL SATIS.	GROWTH SATIS.	CO-WORKER SATIS.	SUPERVISOR SATIS.
SKILL VARIETY	.37	.45	.27	.27
TASK IDENTITY	.30	.51	.37	.10
TASK SIGNIFICANCE	.35	.11	.14	.08
AUTONOMY	.44	.57	.51	.35
FEEDBACK FROM JOB	.33	.40	.54	.50
ROLE AMBIGUITY	-.72	-.89	-.59	-.61
PERSON-ROLE CONF.	-.49	-.54	-.45	-.63
INTRASENDER CONF.	-.46	-.46	-.40	-.27
INTERSENDER CONF.	-.45	-.45	-.31	-.54
ROLE CONFLICT	-.57	-.58	-.45	-.58
PEER SUPPORT	.46	.52	.59	.38
PEER GOAL EMPHASIS	.56	.54	.29	.29
PEER WORK FACIL.	.53	.63	.59	.29
PEER INTERACTION FAC.	.41	.24	.17	.10
SUPERVISOR SUPPORT	.36	.40	.39	.68
SUP. GOAL EMPHASIS	.52	.54	.34	.51
SUP. WORK FACIL.	.57	.72	.64	.74
SUP. INTERACTION FAC.	.50	.35	.32	.48

Note: $r > .33$ are significant at the .05 level

In general, the role variables correlated slightly higher with the satisfaction variables than either the peer or supervisor leadership variables. The lowest correlations with satisfaction were consistently found among the job characteristic variables. For example, the average correlation of the job characteristics with general satisfaction was .29, while the average correlations of the role, peer leadership, and supervisor leadership variables, were .53, .49, and .49, respectively.

Tables 5, 6, and 7 present the intercorrelations of the independent variables. The intercorrelations among role and leadership variables were relatively high, between .35 and .72, indicating that high levels of role conflict and role ambiguity tend to occur together, as do high levels of peer and supervisor leadership. The

TABLE 5. INTERCORRELATIONS AMONG JOB CHARACTERISTICS

	SKILL VARIETY	TASK IDENTITY	TASK SIGNIF.	AUTO- NOMY	FEEDBACK FROM JOB
SKILL VARIETY	1.0				
TASK IDENTITY	.17	1.0			
TASK SIGNIFICANCE	.15	-.07	1.0		
AUTONOMY	.39	.52	.20	1.0	
FEEDBACK FROM JOB	.14	.13	.05	.43	1.0

Note: $r > .33$ are significant at the .05 level

TABLE 6. INTERCORRELATIONS AMONG ROLE VARIABLES

	ROLE AMBIGUITY	PERSON- ROLE CONFLICT	INTRA- SENDER CONFLICT	INTER- SENDER CONFLICT	ROLE CONFLICT
ROLE AMBIGUITY	1.0				
PERSON-ROLE CONF.	.64	1.0			
INTRASENDER CONF.	.39	.28	1.0		
INTERSENDER CONF.	.41	.39	.64	1.0	
ROLE CONFLICT	.55	.60	.83	.92	1.0

Note: $r > .33$ are significant at the .05 level

TABLE 7. INTERCORRELATIONS AMONG LEADERSHIP CHARACTERISTICS

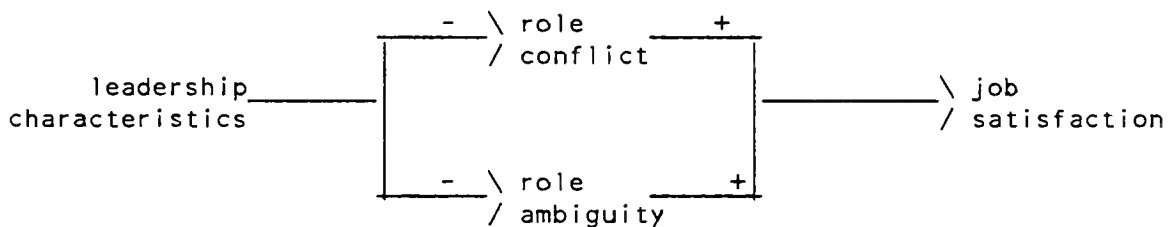
	PEER SUP.	PEER GOAL EMP.	PEER WORK FAC.	PEER INT. FAC.	SUPR. SUP.	SUPR. GOAL EMP.	SUPR. WORK FAC.	SUPR. INT. FAC.
PEER SUPPORT	1.0							
PEER GOAL EMPHASIS	.67	1.0						
PEER WORK FACIL.	.72	.69	1.0					
PEER INTERACTION FAC.	.50	.66	.62	1.0				
SUPERVISOR SUPPORT	.65	.41	.44	.44	1.0			
SUP. GOAL EMPHASIS	.39	.57	.42	.45	.53	1.0		
SUP. WORK FACIL.	.58	.49	.66	.38	.65	.63	1.0	
SUP. INTERACTION FAC.	.37	.43	.51	.72	.52	.58	.62	1.0

Note: $r > .33$ are significant at the .05 level

intercorrelations among the job characteristics were lower, varying between $-.07$ and $.52$.

Correlations among the dependent variables are presented in Tables 8 and 9. There are significant, but relatively weak correlations between both role perceptions and leadership characteristics, and job characteristics. The correlations between role variables and leadership variables tended to be much stronger.

This prompted further investigation into the relationship between leadership characteristics, role perceptions, and job satisfaction. House and Rizzo (1972) observed that the relationship between leadership variables and job satisfaction is moderated by role variables. That is, positive leadership characteristics reduce role conflict and ambiguity and lead to increased satisfaction. This can be diagrammed as follows:



This finding is confirmed in the present study by the partial correlation analysis found in Table 10. In all cases but one, controlling for either role conflict or role ambiguity reduced the relationship between a leadership characteristic and general satisfaction. First order partial correlations controlling for role ambiguity were, in general, smaller than first order partials controlling for role conflict, indicating that role ambiguity is a more important intervening variable than role conflict. The correlations between seven of the eight leadership variables and general satisfaction were greatly reduced when controlling for both role variables. In three cases, controlling for both role

TABLE 8. CORRELATION OF ROLE AND LEADERSHIP VARIABLES WITH JOB CHARACTERISTICS

	SKILL VARIETY	TASK IDENTITY	TASK SIGNIF.	AUTO- NOMY	FEEDBACK FROM JOB
ROLE AMBIGUITY	-.33	-.48	-.07	-.47	-.47
PERSON-ROLE CONF.	-.25	-.42	-.37	-.50	-.55
INTRASENDER CONF.	-.18	-.35	-.08	-.21	-.17
INTERSENDER CONF.	-.21	-.19	-.02	-.42	-.04
ROLE CONFLICT	-.26	-.36	-.14	-.45	-.10
PEER SUPPORT	.32	.41	.09	.51	.29
PEER GOAL EMPHASIS	.32	.25	.29	.38	.12
PEER WORK FACIL.	.55	.26	.00	.40	.31
PEER INTERACTION FAC.	.21	-.19	.08	.21	.07
SUPERVISOR SUPPORT	.31	.13	-.10	.50	.44
SUP. GOAL EMPHASIS	.24	.05	.12	.24	.26
SUP. WORK FACIL.	.47	.10	.05	.44	.40
SUP. INTERACTION FAC.	.32	-.20	-.10	.13	.16

Note: $r > .33$ are significant at the .05 level

TABLE 9. CORRELATIONS BETWEEN LEADERSHIP CHARACTERISTICS AND ROLE VARIABLES

	ROLE AMBIGUITY	PERSON- ROLE CONFLICT	INTRA- SENDER CONFLICT	INTER- SENDER CONFLICT	ROLE CONFLICT
PEER SUPPORT	-.52	-.45	-.48	-.34	-.50
PEER GOAL EMPHASIS	-.48	-.44	-.40	-.40	-.50
PEER WORK FACIL.	-.58	-.32	-.46	-.26	-.41
PEER INTERACTION FAC.	-.13	-.12	-.28	-.25	-.28
SUPERVISOR SUPPORT	-.37	-.41	-.18	-.38	-.39
SUP. GOAL EMPHASIS	-.52	-.41	-.35	-.55	-.55
SUP. WORK FACIL.	-.70	-.44	-.46	-.56	-.61
SUP. INTERACTION FAC.	-.34	-.22	-.32	-.46	-.44

Note: $r > .33$ are significant at the .05 level

TABLE 10. PARTIAL CORRELATIONS OF LEADERSHIP CHARACTERISTICS AND GENERAL SATISFACTION CONTROLLING FOR ROLE CONFLICT AND AMBIGUITY

<u>GENERAL SATISFACTION</u>				
	ZERO ORDER CORRELATION	1ST ORDER PARTIAL CONTR. FOR ROLE AMB.	1ST ORDER PARTIAL CONTR. FOR ROLE CONF.	2ND ORDER PARTIAL CONTR. FOR ROLE CONF. AND AMB.
PEER SUPPORT	.46	.14	.25	.06
PEER GOAL EMPHASIS	.56	.35	.39	.29
PEER WORK FACIL.	.53	.20	.39	.17
PEER INTERACTION FAC.	.41	.46	.32	.42
SUPERVISOR SUPPORT	.37	.15	.19	.09
SUP. GOAL EMPHASIS	.52	.25	.31	.16
SUP. WORK FACIL.	.57	.13	.35	.03
SUP. INTERACTION FAC.	.50	.40	.35	.33

Note: $r > .33$ are significant at the .05 level

variables reduced the correlations to below .10, and in three other cases it reduced the correlations to between .10 and .30.

DISCUSSION

The results presented above support our hypotheses that both leadership characteristics and role perceptions are important determinants of job satisfaction in programmer/analysts. These results lead to three conclusions that have significant implications for both MIS researchers and practioners who are interested in improving the systems development process. In this section, these conclusions and their implications are discussed in detail. Recommendations are then made for future research in this area.

The most significant of the conclusions is that the Job Characteristic Model is not adequate for examining the determinants of job satisfaction in programmer/analysts. The data provide a great deal of evidence to support this conclusion. First, the programmer/analysts in this survey scored highly on the dealing with others scale, indicating that they do not work 'more or less alone' as required by the Job Characteristic Model. Their average score (6.3) is more similar to the average score of managers (6.4) and salespeople (6.4) than to the average score of other technical workers (5.8), and is well above the national norm (5.6) for this measure (Hackman and Oldham, 1980). Second, correlations between job satisfaction and role and leadership variables were consistently higher than correlations between job satisfaction and job characteristics. This indicates that the interactions of programmer/analysts with others are more important sources of satisfaction for these workers than the characteristics of the tasks they perform.

This finding is important for researchers and managers interested in redesigning the work performed by programmer/analysts to increase job satisfaction and productivity. If the Job Characteristic Model were to be used as the sole basis for work redesign, the redesign would focus on job enrichment. This would involve changing the tasks performed by programmer/analysts to improve some of the five job characteristics. For example, a possible work redesign could give each programmer/analyst complete control of a specific part of a systems development project from systems analysis through testing. This should increase skill variety, task identity, and autonomy leading to increased job satisfaction. A job change like this, however, will affect the interactions between programmer/analysts, users, and project leaders. It could lead to reduced job satisfaction by increasing the conflict between users and the programmer/analyst and by increasing the ambiguity in the programmer/analyst's job.

Work redesign for programmer/analysts should, therefore, take a broader perspective, not just concentrating on job enrichment. A socio-technical systems approach as advocated by Cherns (1976) and others would be more appropriate. This approach to work redesign focuses on both the social and technical aspects of work. Work redesign is based on an examination of the interactions and the flow of information among those involved in systems development as well as the tasks performed by programmer/analysts.

A second important result of this study is the significance of role perceptions as determinants of job satisfaction. Strong correlations between role ambiguity and job satisfaction and slightly weaker correlations between role conflict and job satisfaction support Bostrom's (1980) findings in his study of systems designers and are consistent with results obtained by Rizzo, House, and Lirtzman (1970), House and Rizzo (1972), and Schuler, Aldag, and Brief (1977) in studies involving many different types of jobs. The high correlations between role perceptions and job satisfaction indicate that reducing role conflict and ambiguity could be an effective way to improve job satisfaction in programmer/analysts.

One change in the organization of the systems development process that could reduce role conflict and ambiguity is the use of user liaisons. Some organizations have trained members of user groups in systems design and made them part of the development team. These people act as liaisons between the user group and the programmer/analysts. By facilitating communication between the two groups, the liaisons could reduce the amount of intersender role conflict perceived by the programmer/analysts. They could also reduce role ambiguity by eliminating some of the less well-defined tasks that the programmer/analysts perform.

This result also has implications for researchers interested in the effects of productivity aids on job satisfaction. Many productivity aids now being used add

structure to the systems development process by providing guidelines for programmer/analysts and by providing a formal language for documenting systems analysis and design (Goldstein, 1982a). Some researchers have argued that the use of these structured productivity aids will lead to the routinization of systems development (Kraft, 1977). If this were the case we would expect several job characteristics to be affected. The programmer/analysts' skill variety could be reduced by making systems development more routine. Their autonomy could be reduced by imposing the guidelines that are part of the productivity aid. Their task identity could also be reduced by splitting the development process into smaller pieces.

These productivity aids, however, could have the opposite effect on job satisfaction, if we take role perceptions into account. This author (Goldstein, 1982a) found that using one class of productivity aids - structured analysis methods - gave programmer/analysts a better understanding of the user's business and facilitated communication between users and systems developers. These aids could, therefore, lead to reduced role ambiguity by providing programmer/analysts with a better understanding of what they should be doing. They could lead to reduced intrasender role conflict by increasing the resources available to programmer/analyst and by increasing their capabilities. They could also lead to reduced intersender role conflict by improving communications with users. Thus, the use of productivity aids could lead to increased job satisfaction in programmer/analysts.

A third result of this study concerns the causal link between leadership characteristics, role perceptions, and job satisfaction. The partial correlation analysis in Table 10 supports the findings of House and Rizzo (1972) that role perceptions, and especially role ambiguity, act as intervening variables between

leadership characteristics and job satisfaction. This is especially true for the pair of leadership characteristics that measure supervisor and peer work facilitation - the amount of aid peers and supervisors provide in planning, scheduling, and organizing work for the programmer/analyst. This indicates that an increase in the amount of aid provided by supervisors and peers could cause a decrease in the amount of role ambiguity - and to a lesser extent role conflict - perceived by programmer/analysts, which could, in turn, cause an increase in programmer/analysts' job satisfaction.

Leadership training could, therefore, be an important method for improving the job satisfaction and possibly the productivity of programmer/analysts. Many programmer/analysts and project leaders have a great deal of technical training in programming and systems design. Many have technical degrees and have followed a career path that leads from program maintenance to program development and then to systems design, systems analysis, and project management. These programmer/analysts and project leaders are lacking training and experience in management - planning, organizing, and controlling work - and in interpersonal skills. Training of both programmer/analysts and project leaders in these areas could lead directly to reduced role conflict and ambiguity and indirectly to improved job satisfaction. Since these skills will make programmer/analysts and project leaders more effective in carrying out their jobs, this training could also lead to improving the productivity of programmer/analysts and the quality of the systems they develop.

At this point it is important to interject a word of caution concerning the use of partial correlations. Even though it is logical to assume that role perceptions act as intervening variables between leadership characteristics and job satisfaction, the direction of this causal link cannot be determined with certainty by a partial correlation analysis. The data in Table 10 could also be used to

support the hypothesis that leadership characteristics act as intervening variables between role perceptions and job satisfaction. A longitudinal study is needed to determine with certainty the direction of the causal links between the variables.

Implications for Future Research

The conclusions discussed above highlight the importance of studying the determinants of job satisfaction in programmer/analysts and the need for further research in this area. This section discusses some specific research projects that explore further some issues raised in the previous section.

One research project that should be undertaken is a replication of this study. There are several limitations to this study that point up the need for a replication. First, it is not certain if the sample is representative of programmer/analysts in general. The small number of subjects and the fact that the subjects scored lower than the norms established by Couger and Zawacki (1980) could mean that the sample was atypical. Second, since the sample was chosen from one company, the results might not hold for other companies, especially for companies in other industries and other parts of the country. Third, all programmer/analysts in this study were involved in systems development. The results might differ if we studied programmer/analysts involved in systems maintenance. Fourth, the low reliability of some of the scales reduces our ability to interpret results involving those scales. Ideally, a replication of this study would involve surveying programmer/analysts in a variety of organizations, in different industries and in different parts of the country. This would allow us to determine the external validity of our results.

A second area where research is warranted is the examination of the effects of certain environmental factors on job satisfaction and its determinants. For

example, a survey could be used to examine the differences in job satisfaction between programmer/analysts involved in systems development and those involved in systems maintenance. It is likely that maintenance programmer/analysts would be less satisfied than development programmer/analysts, because their jobs are more routine. We might also find that maintenance programmer/analysts derive more satisfaction from job characteristics, because they deal less with people outside their work group. If this were the case the strategies needed for improving systems maintenance jobs would be different than the strategies recommended in the previous section for improving systems development jobs.

A second topic that can be examined with a survey is the link between productivity and job satisfaction. There is a great deal of debate as to whether productivity is a determinant of job satisfaction or whether the reverse is true (Locke, 1976). Recent research by Bagozzi (1980) and others indicate that the former is correct. This could mean that increasing the productivity of programmer/analysts could lead to increased satisfaction. Before we can test this hypothesis, an adequate measure of productivity for programmer/analysts must be developed. Although there has been much research in this area (see Jones, 1981 for a summary of this research) no single agreed upon measure has been developed. Once a measure is found, a survey could be used to examine the strength and direction of the link between productivity and job satisfaction.

There are several areas where longitudinal research can be used to examine job satisfaction. One area of particular importance is the study of the effects of productivity aids on job satisfaction. As mentioned above, there is some controversy as to whether the use of productivity aids leads to increased or decreased job satisfaction. A longitudinal study could be used to examine the change in job satisfaction attributed to the use of productivity aids. This author

(Goldstein, 1982b) has presented the design of such a study.

Longitudinal research can also be used to examine the effects of other job or organizational changes on job satisfaction. For example, we might want to study the change in job satisfaction, role perceptions, and leadership characteristics caused by giving programmer/analysts and project leaders a leadership training course as recommended in the previous section. We might also want to examine the effects of introducing user liaisons on role perceptions and job satisfaction.

As can be seen in this section, this study raises as many questions as it answers. It highlights the importance of the quality of leadership provided by project leaders and co-workers, and of the interactions of programmer/analysts with others as determinants of job satisfaction. It also points up the need for further research to validate this study and to examine in greater detail ways to improve productivity and job satisfaction in programmer/analysts.

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